Research Objects

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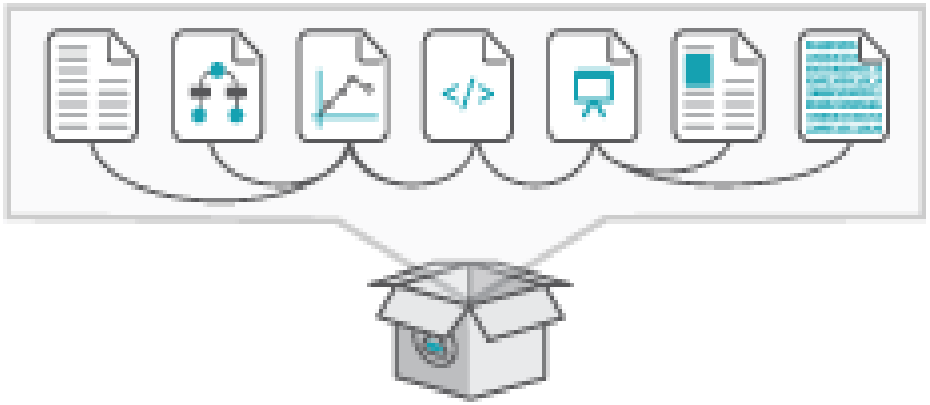
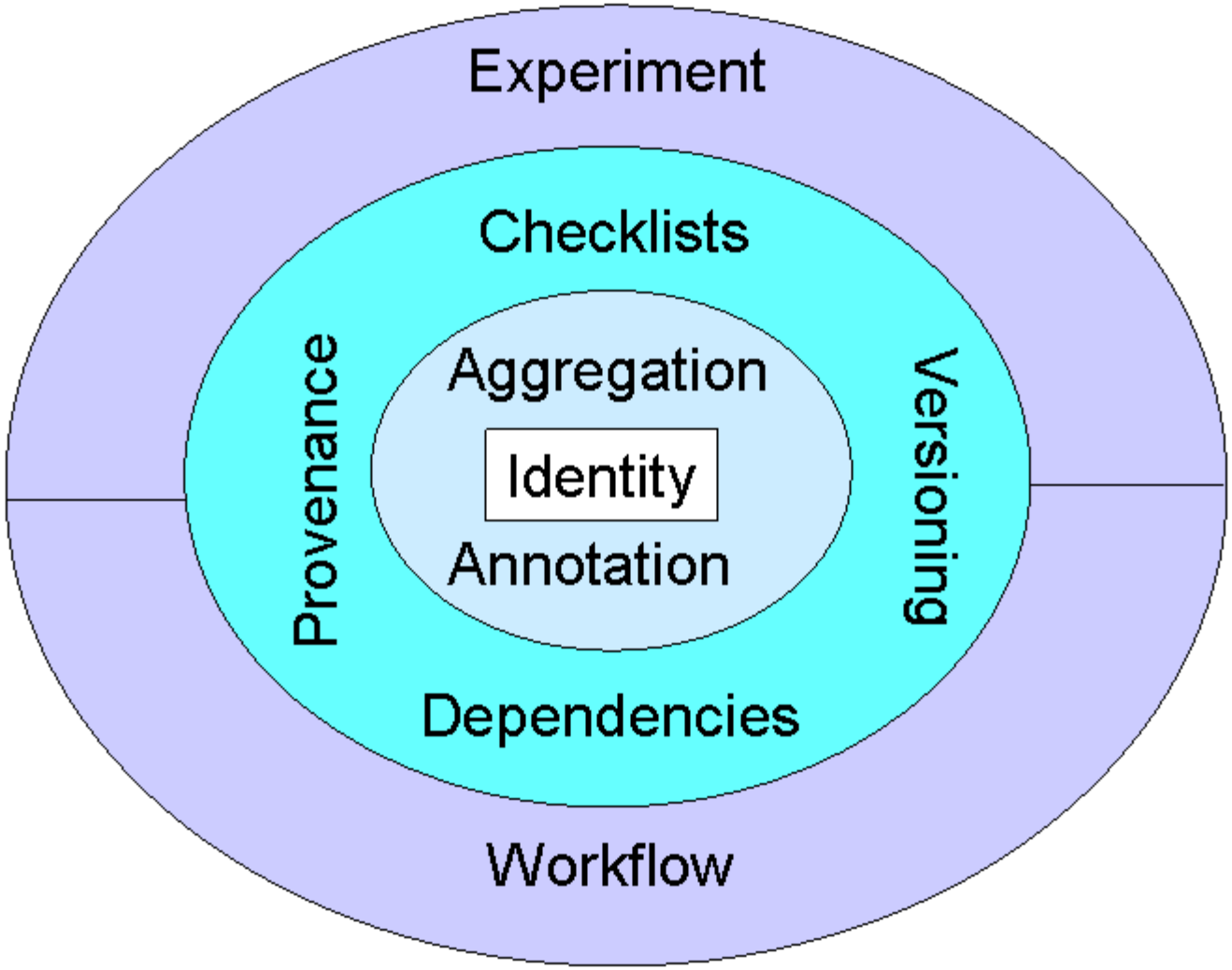
What is a Research Object?

•Aggregation of resources that bundles together the contents of a research work:

- •Data
- •Experiments
- •Examples
- •Bibliography
- •Annotations
- •Provenance
- •ROs
- •Etc.



RO at 5000 feet

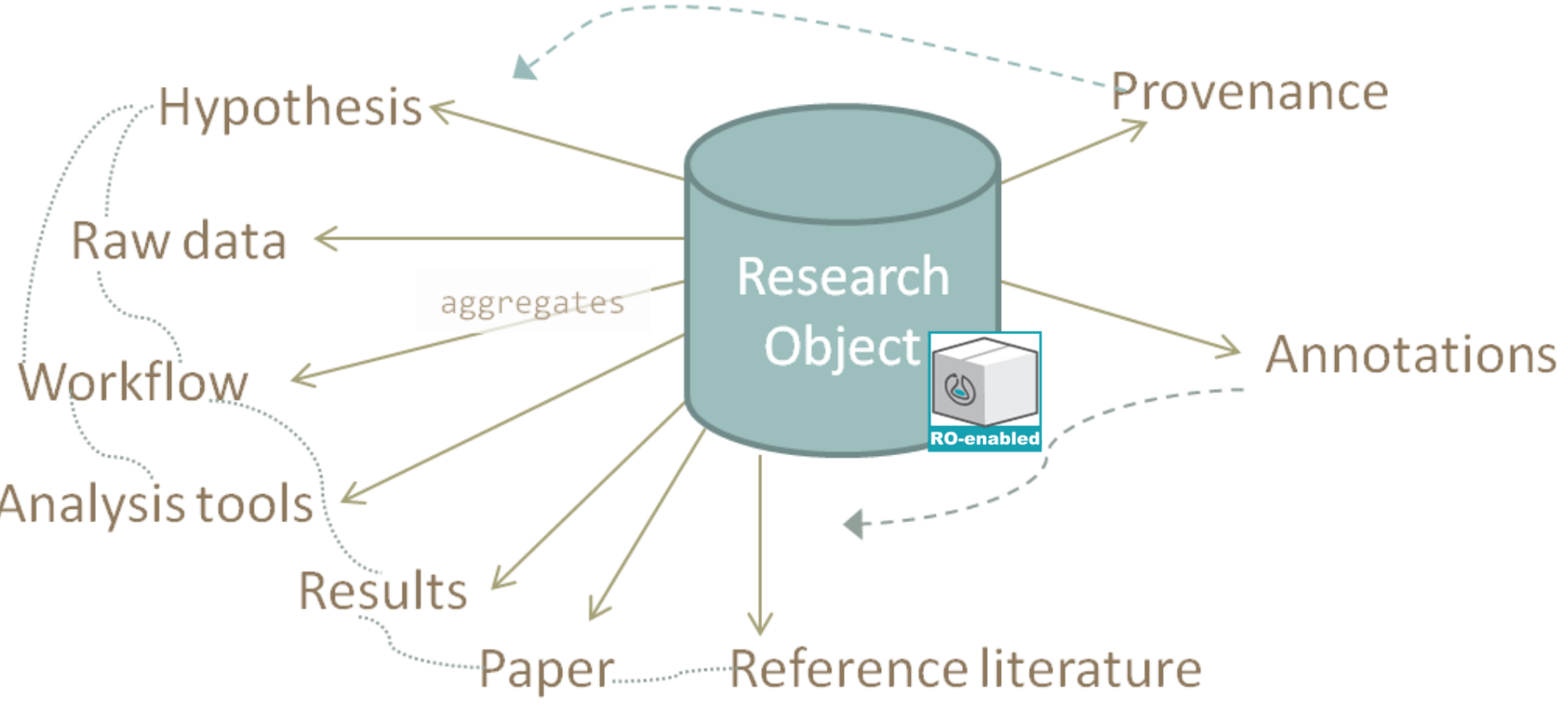


Why Research Objects?

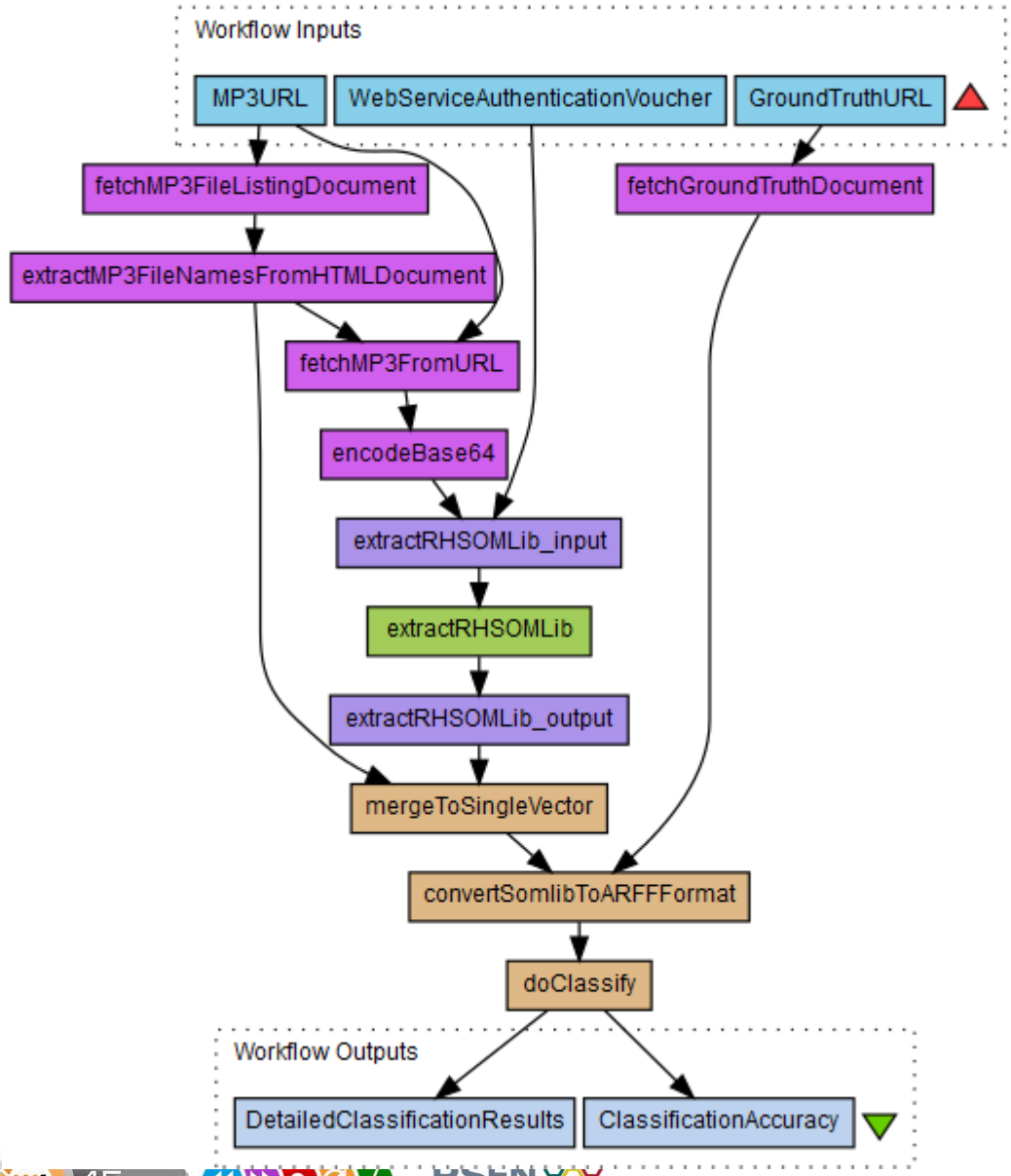
- **Process preservation**: URIs/dois for referencing resources.
- **Reusability** of any part of the RO
- **Repeatability /Reproducibility**: redeployment of the method
- **Traceability** and error detection.

- **Attribution**: able to cite data and publications of the RO
- **Understandability**: Links between data, results and annotations.
- **Curation**: by explicitly exposing the methods of the experiment.

What can you find in a Research Object?



Scientific Workflows



- Digital instrument that allows scientists to represent computational and data manipulation steps.
- Coordinates the execution and links the resources together.

What can you find in a Research Object? A real example

myexperiment

About | Mailing List | Publications

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Home | Users | Groups | Workflows | Files | Packs | Services

All | Search

Home > Packs > GWAS to pathway

Pack: GWAS to pathway

Created at: 07/02/13 @ 08:32:47

| Tags (0) | Featured in Packs (0) | Favourited By (0) | Comments (0) |

Title: GWAS to pathway

Research object: http://sandbox.wf4ever-project.org/rodl/ROs/Pack384/

Description

This pack is for a workflow that finds KEGG pathways for genes from a GWAS.

Uploaded by

- Stian Soiland-Reyes (last uploaded on 2012-12-24 18:40)
- Khalid Belhajjame (last uploaded on 2012-11-02 18:40)

Authors

- Kristina Hettne (last authored on 2012-12-24 18:40)
- Marco Roos (last authored on 2012-10-15 11:24)

Contributors

Creator

Marco Roos

6 items in this pack

Navigate RO

- root
  - biblio/
    - produced/
    - used/
  - config/
    - scripts/
    - setup/
    - software/
    - web services/

New/Upload

Pack | GO

Stian Soiland-Reyes

My Profile [edit]
My Messages (3)
My Memberships
My History
My News

3 new messages
RE: hehe..
RE: Hello
RE: testing

1 new friendship request
Raul Palma

My Stuff

21 Friends | 5 Groups | 47 Workflows | 17 Packs

What can you find in a Research Object? A real example (2)

COMMON MOTIFS IN SCIENTIFIC WORKFLOWS: AN EMPIRICAL ANALYSIS

This page represents a bundle for the contents of the analysis currently submited to the Future Generation Computer Systems Journal. The analysis is an expansion of a paper published in eScience 2012 (link to the paper), and it is currently under review. The purpose of this web page is to make accessible, link and describe the inputs and outputs of the analysis, which are stored as a **Research Object (pack) in myExperiment**.

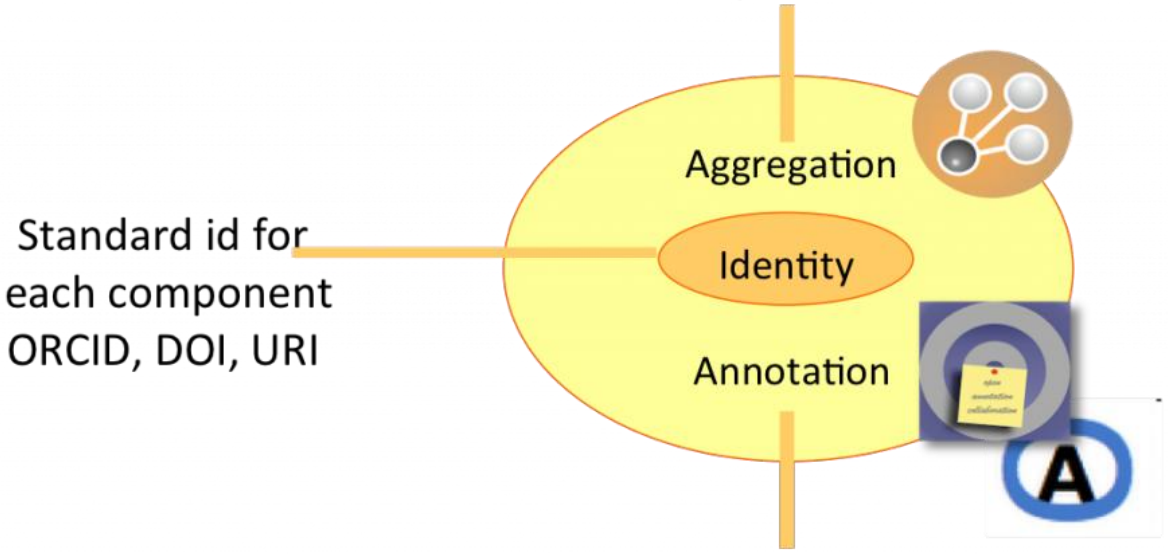
ABSTRACT

Workflow technology continues to play an important role as a means for specifying and enacting computational experiments in modern Science. Reusing and repurposing workflows allow scientists to do new experiments faster, since the workflows capture useful expertise from others. As workflow libraries grow, scientists face the challenge of finding workflows appropriate for their task, understanding what each workflow does, and reusing relevant portions of a given workflow. We believe that workflows would be easier to understand and reuse if high-level views (abstractions) of their activities were available in workflow libraries. As a first step towards obtaining these abstractions, we report in this paper on the results of a manual analysis performed over a set of real-world scientific workflows from Taverna, Wings, Galaxy and Vistrails. Our analysis has resulted in a set of *scientific workflow motifs* that outline i) the kinds of data-intensive activities that are observed in workflows (*data-oriented motifs*), and ii) the different manners in which activities are implemented within workflows (*workflow-oriented motifs*). These motifs are helpful to identify the functionality of the steps in a given workflow, to develop best practices for workflow design, and to develop approaches for automated generation of workflow abstractions.

INPUTS AND EXAMPLES OF THE ANALYSIS

Research Objects: An Overview

OAI-ORE
http://www.openarchives.org/ore/
Structuring and Bundling descriptions and components.

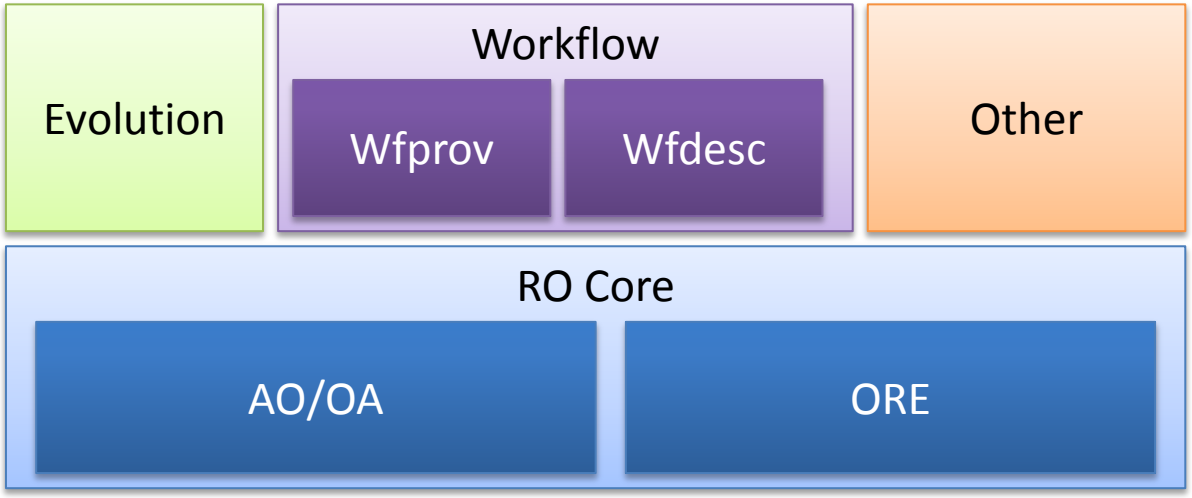


Annotation Data Ontology (AO) + Open Annotation
http://code.google.com/p/annotation-ontology/
A generic, domain-neutral annotation framework
http://www.openannotation.org/spec/core/

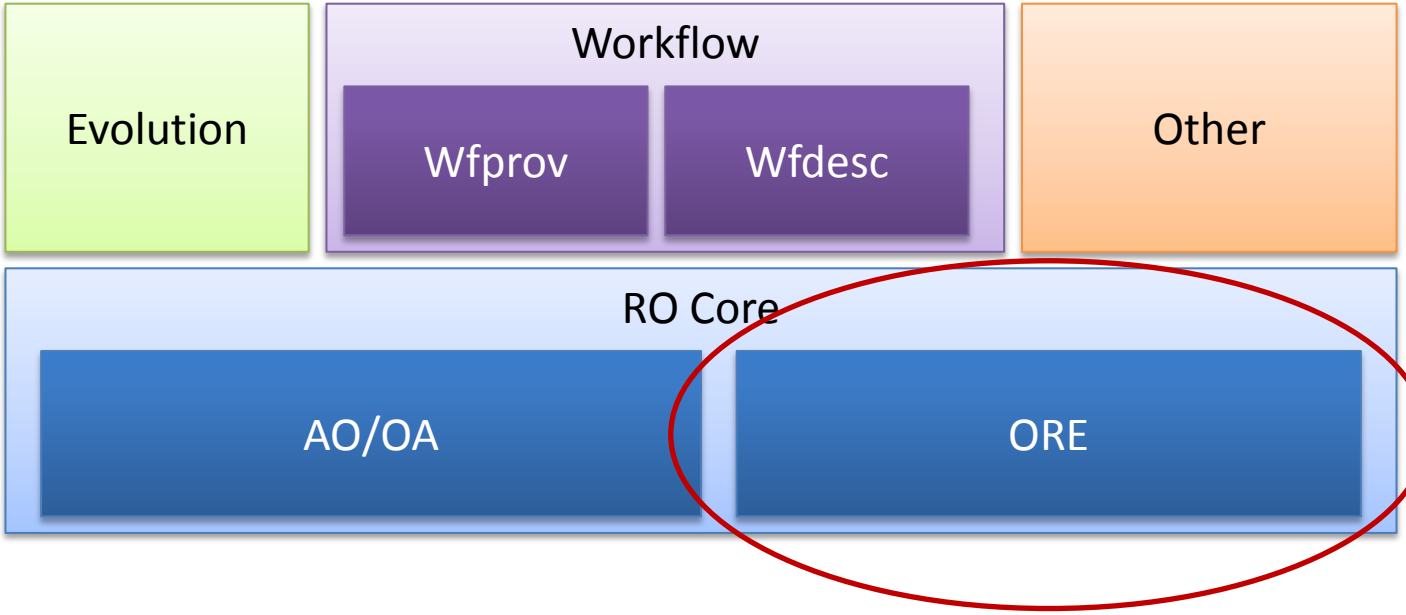
- Tool support
- Interoperability

Research Objects: An Overview

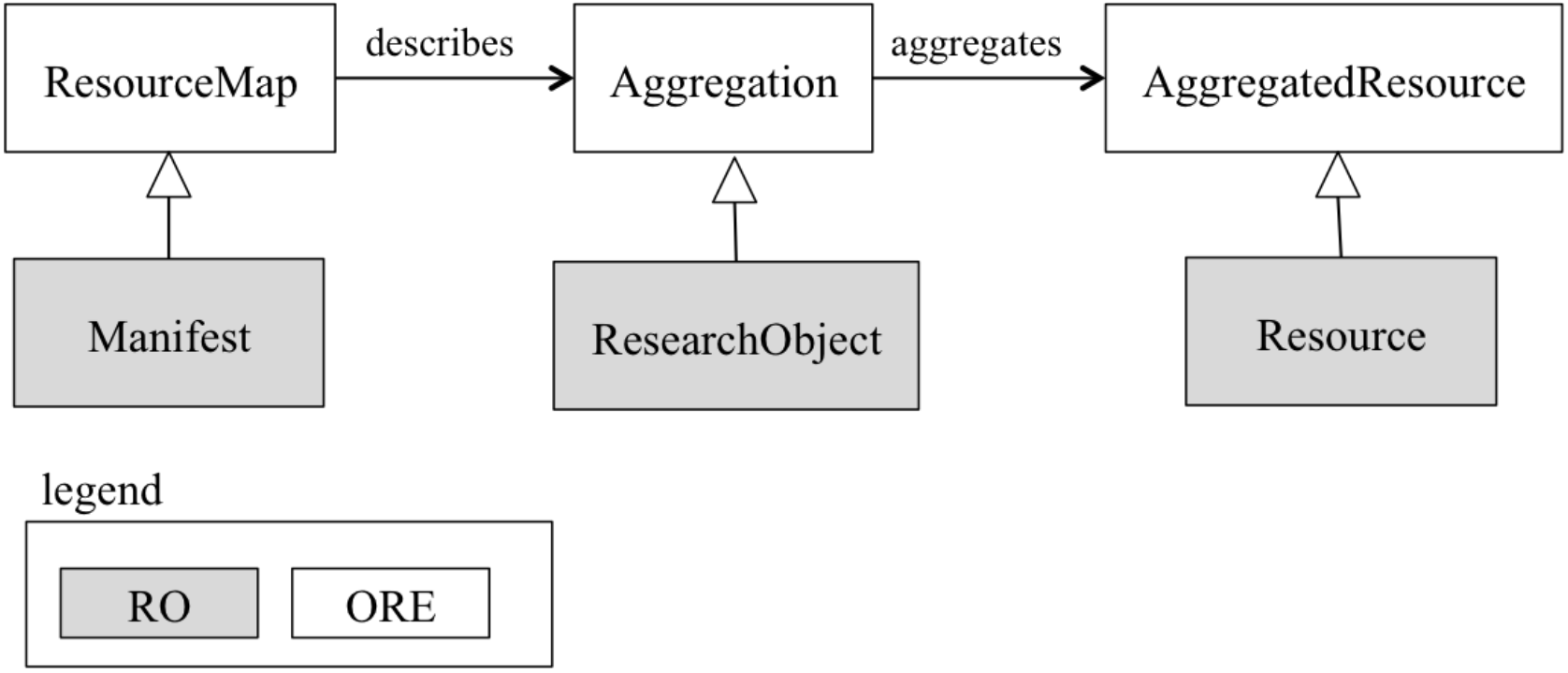
- Vocabulary for describing Research Objects
- Generic
- Extensible to multiple domains
- Modular



The Research Object Model: ORE

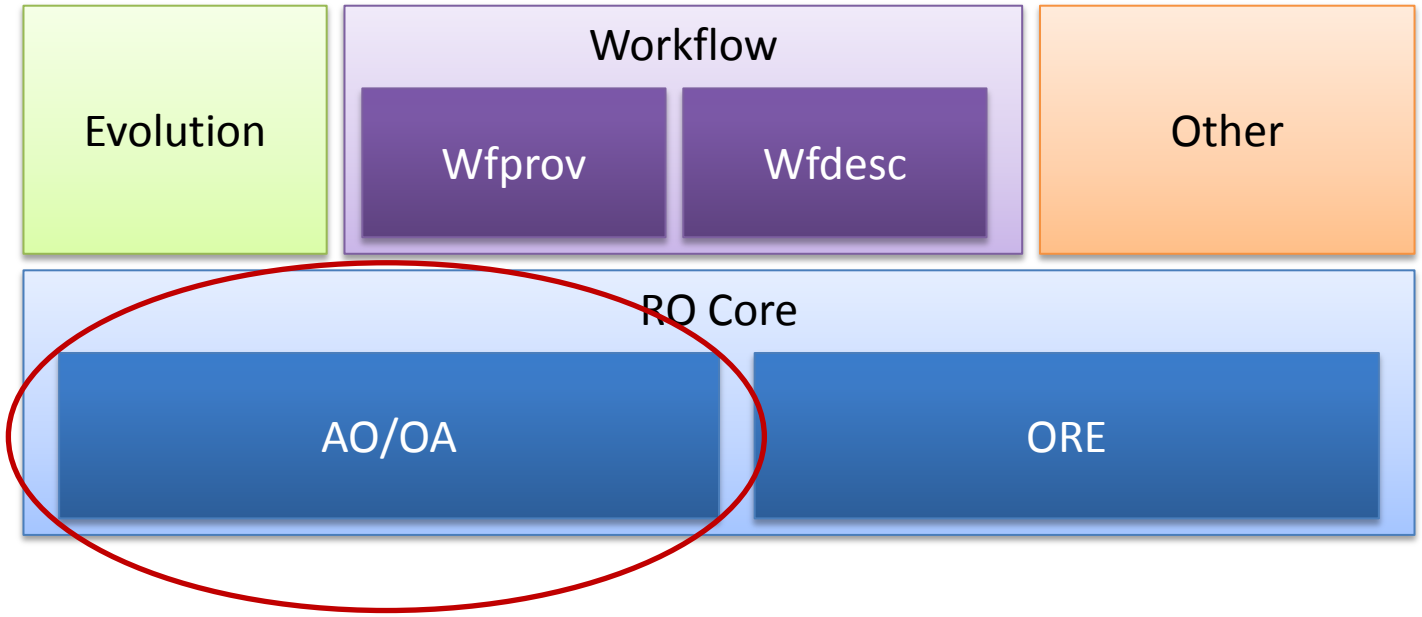


The Research Object Model: ORE

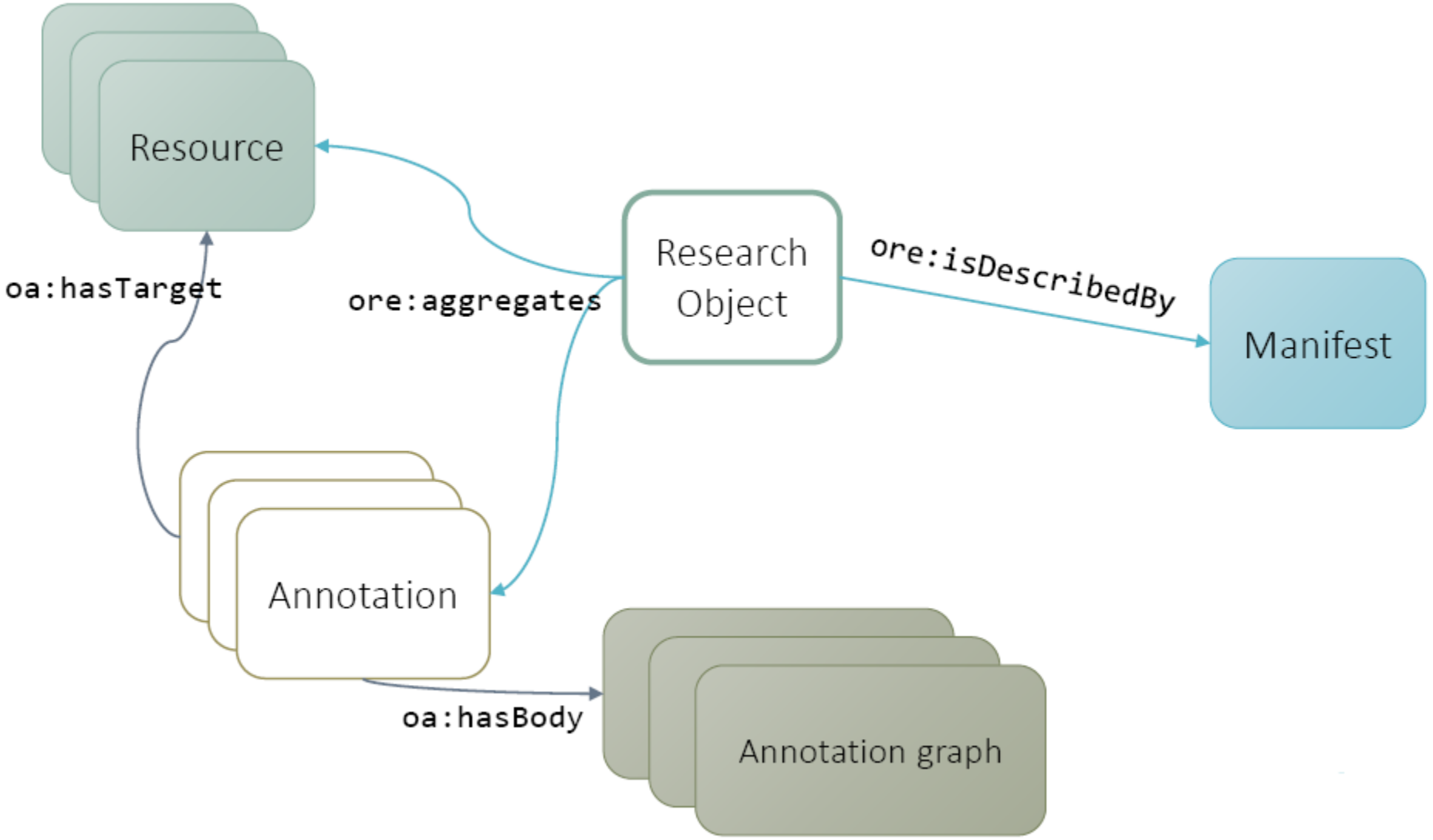


- ORE: Object Reuse and Exchange
- Resources can be further specialized according to the domain

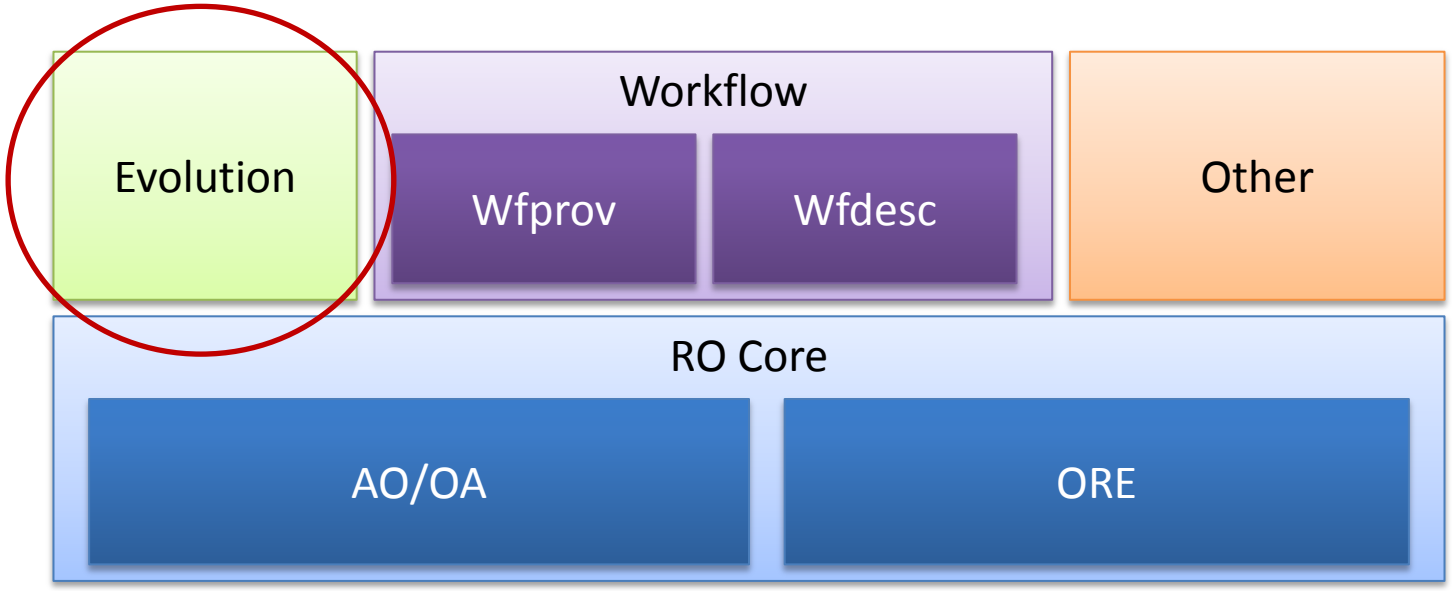
The Research Object Model: AO



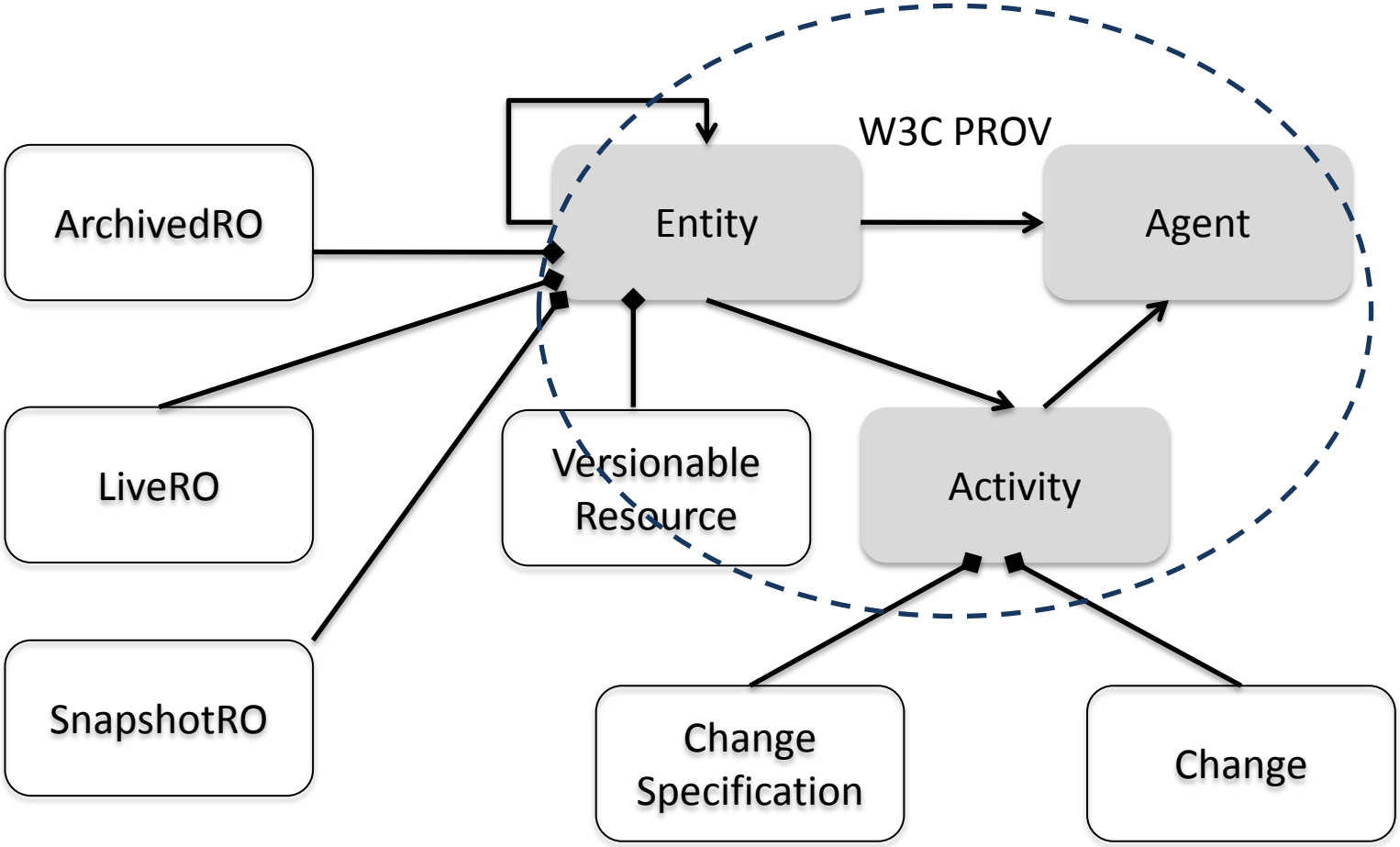
The Research Object Model: Annotations



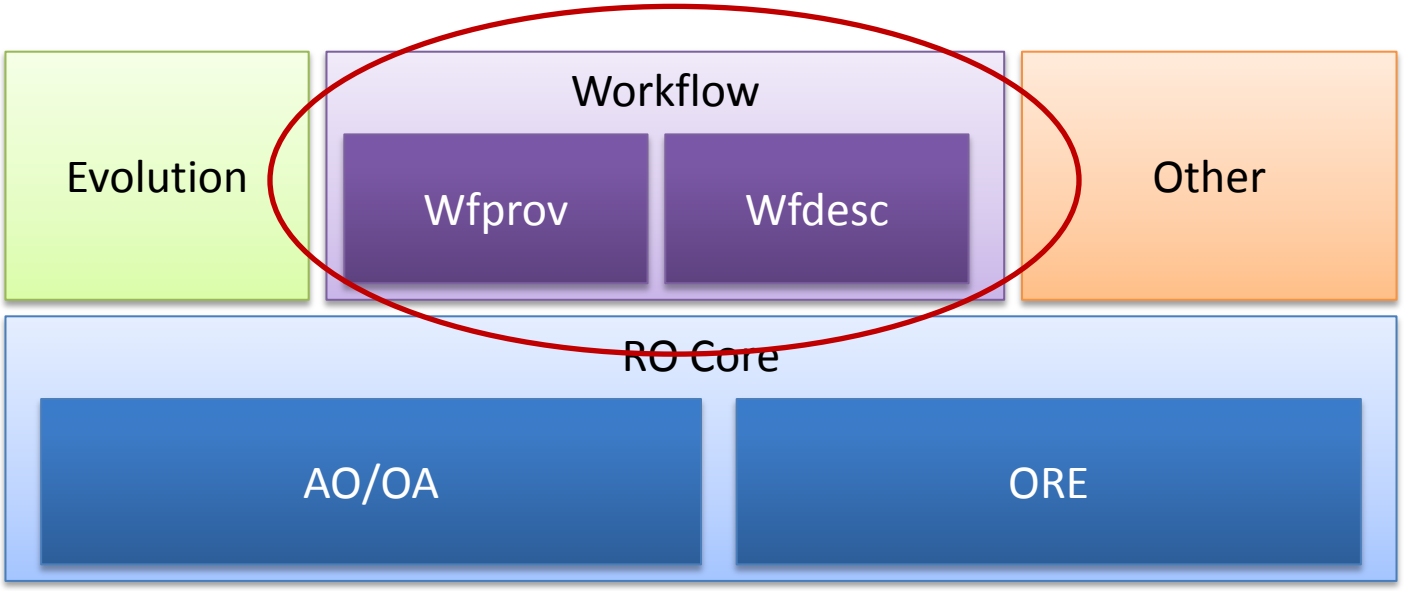
The Research Object Model: Roevo



The Research Object Model: Evolution of ROs



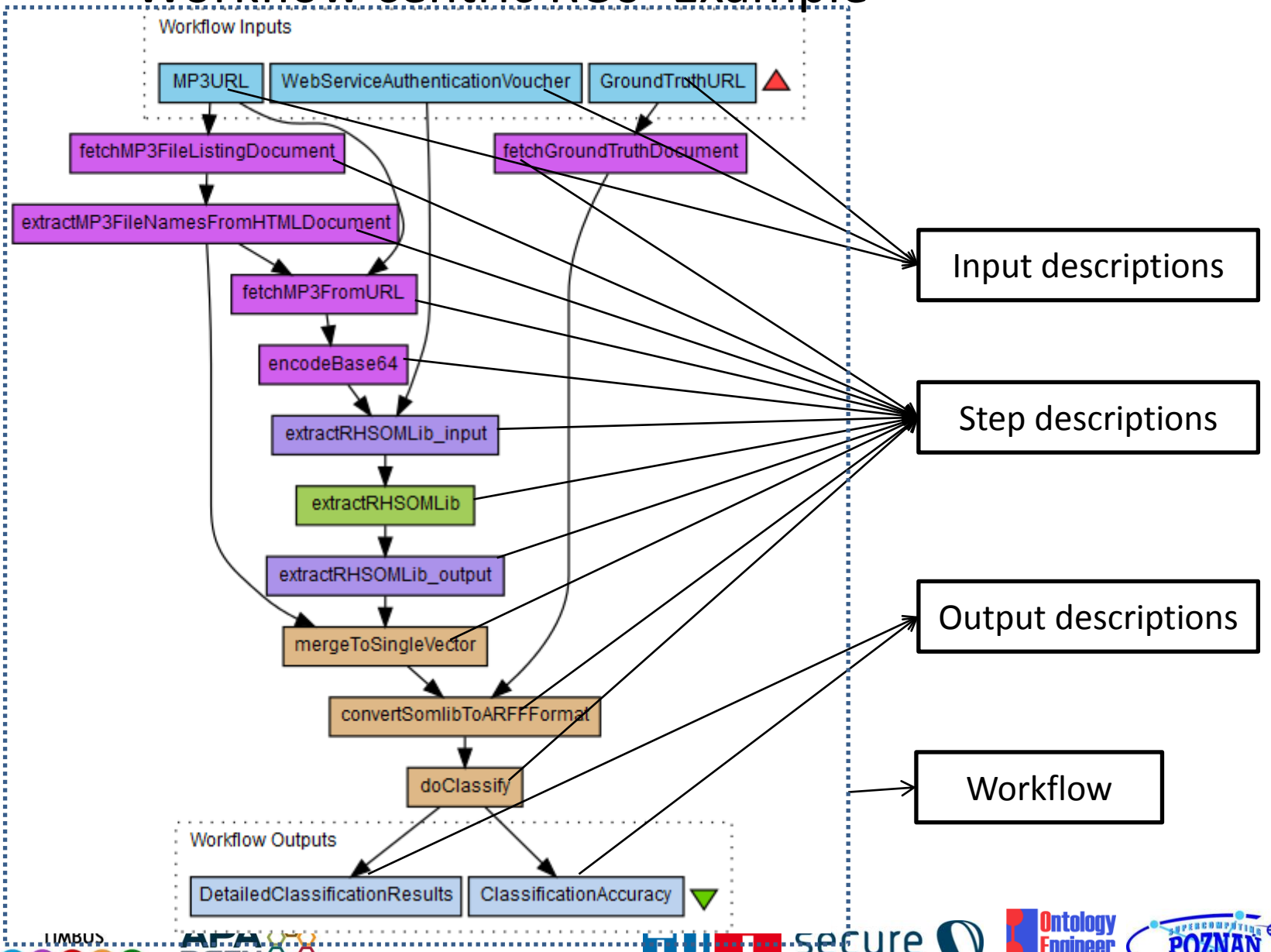
The Research Object Model: Workflow



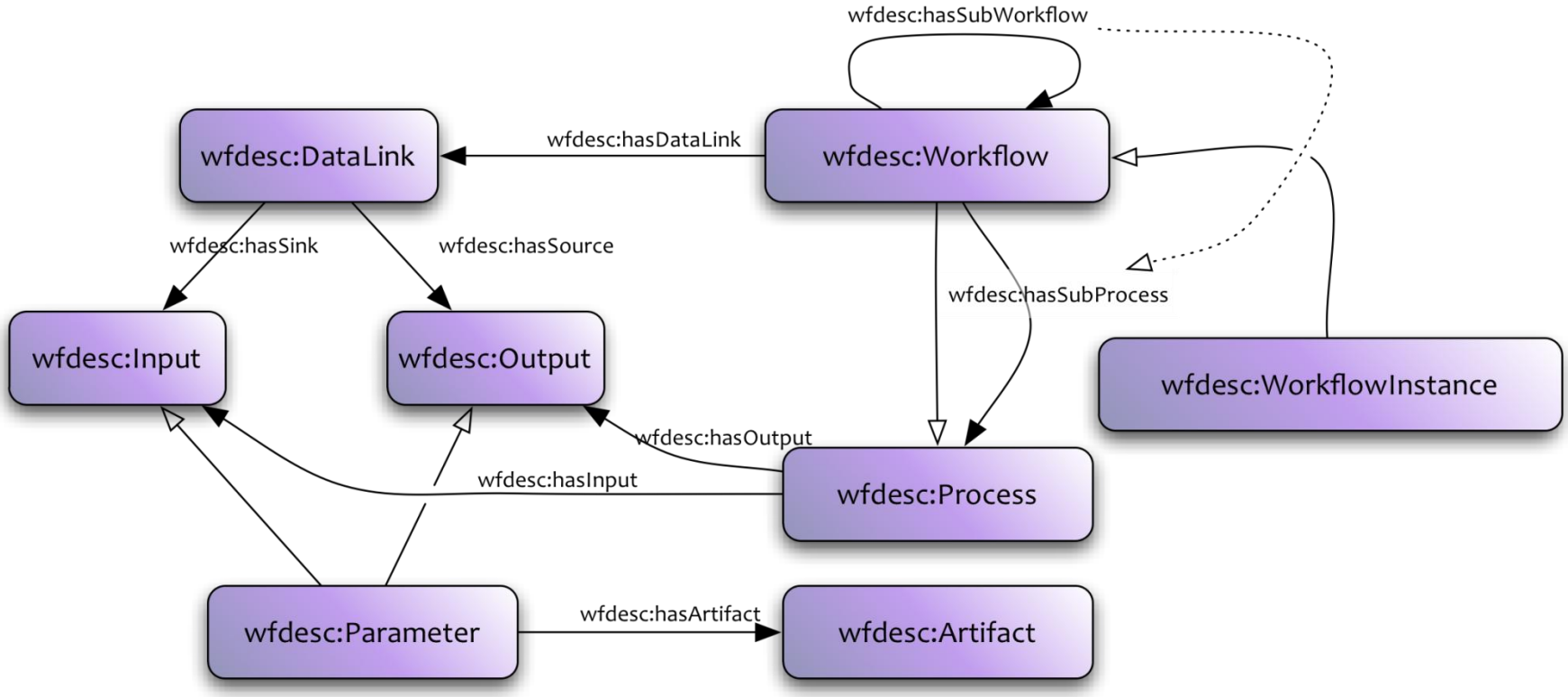
The Research Object Model: Workflow centric ROs

- Vocabulary for **describing scientific workflows as ROs**
- Reuse of standards (**PROV**)
- Compatible with other vocabularies for workflow representation
- Focused on:
  - **Workflow description** (wfdesc): how the specification of the workflow was planned
  - **Workflow provenance** (wfprov): how the results have been obtained

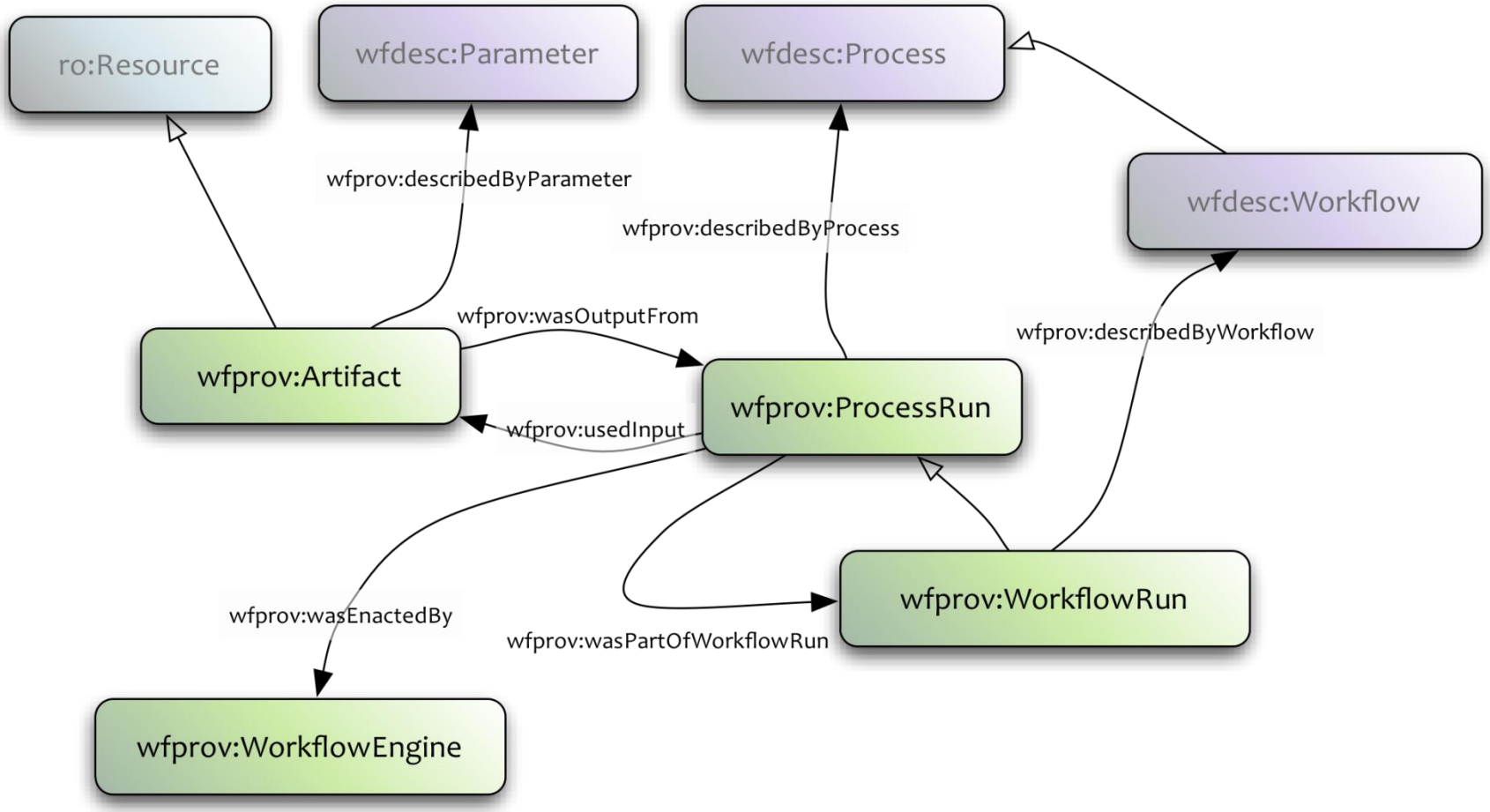
The Research Object Model: Workflow centric ROs- Example



The Research Object Model: workflow description



The Research Object Model: workflow provenance



RO-ify your work!

http://researchobject.org/

Join the discussion…

W3C Research Object for Scholarly Communication Community Group
http://www.w3.org/community/rosc/

RO Tools presentation coming after the break…

Acknowledgements: Wf4Ever project

Special thanks to Stian Soiland Reyes, Kevin Page and Oscar Corcho.

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